NEW SPECIES AND VARIETY OF THE GENUS MENISPERMUM (MENISPERMACEÆ)

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ABSTRACT: The genus *Menispermum* is known to possess three valid species: *M. canadense*, *M. dahuricum* and *M. mexicanum*. While examining the herbarium materials of this genus obtained from different parts of the world, two new species were obtained, namely, *M. chinensis* Kundu & Guha and *M. miersii* Kundu & Guha, and these are described in this paper. Besides this, anatomical and palynological (except *M. mexicanum* Rose) studies were done on *M. canadense*, *M. dahuricum*, *M. mexicanum* and the two new species and these have been described here. Our observation suggests that *M. mexicanum* Rose should be treated as a variety of *M. dahuricum*, namely, *M. dahuricum* var. *mexicanum* (Rose) Kundu & Guha.

RÉSUMÉ : Le genre *Menispermum* comportait jusqu'à présent 3 espèces : *M. canadense*, *M. dahuricum* et *M. mexicanum*. A la suite de l'étude du matériel d'herbier se rapportant à ce genre et provenant de différentes régions du monde, 2 nouvelles espèces ont été reconnues : *M. chinensis* Kundu & Guha et *M. miersii* Kundu & Guha; elles sont décrites dans ce travail. En outre, une étude anatomique et palynologique (sauf chez *M. mexicanum*) de toutes ces espèces a été faite. A la suite de ces observations, *M. mexicanum* est traitée comme une variété de *M. dahuricum*.

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The genus *Menispermum* is known to possess two valid species, *M. canadense* and *M. dahuricum*. A third species, *M. mexicanum* was later reported by ROSE (1911) from Mexico. While examining the herbarium materials of the genus *Menispermum* obtained from U.S. National Herbarium, Calcutta Herbarium and Tokyo University Herbarium, two sheets were observed to be quite different from those of *M. canadense* and *M. dahuricum* and appeared to be new.

Detailed morphological and comparative anatomical studies of *M. canadense*, *M. dahuricum* and also *M. mexicanum* and the two materials which appeared to be new, have been carried out. The two materials have been described as new species. *M. mexicanum* Rose appeared to be more or less similar to *M. dahuricum*, but in view of its certain distinct anatomical differences this has been treated as a variety of *M. dahuricum*.

The two new species have been found to be related to *M. dahuricum* DC. by having only few flowers in the inflorescence and also few stamens

(10-12) in the flower. However, in both of them many morphological and anatomical differences from *M. dahuricum* have been observed. Of the two new species, the one from China, have been named as *M. chinensis* and the other from U.S.S.R. have been named as *M. miersii.*

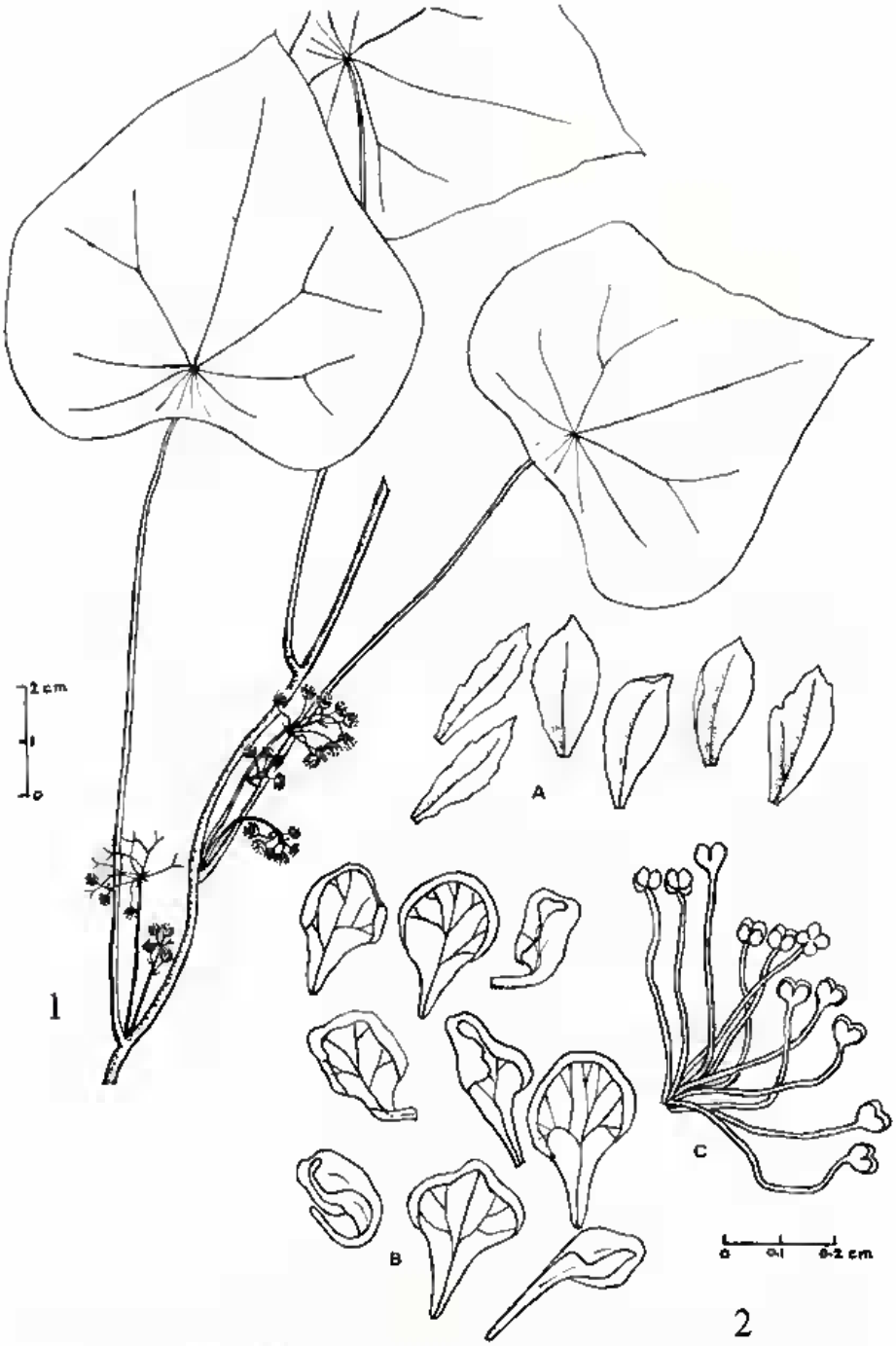
Menispermum miersii Kundu & Guha, *sp. nov.*

Herba scandens. Caulis costatus, solidus, parum pubescens; internodia 4-6.5 cm longa. Folia petiolata, peltata, triangulari-ovata vel 5 lobata, margine integra vel lobata apice mucronata, basi parum cordata vel truncata, chartacea, 3.8-7.3 cm longa, 5.1-7.1 cm lata, plerumque palmatim 10-nervia, infra distincte pubescentia, supra pilis paucis in nervis, petiolis 3-13.5 cm longis gracilibus, laminis multo longioribus, sursum parum pubescentibus, 0.9-1 cm a basi laminarum insertis.

♂ inflorescentia axillaris, solitaris vel binata, pedunculata, umbellata, 7-13-flora; pedunculus 2.5-3.9 cm longus, nervatus, glaber in ramis foliatis. ♂ flores pedicellati, 3.5-5 mm longi (pedicello excepto) et 4.5-6 mm lati; pedicellus 3-6.5 mm longus, bracteatus, bractea lineari-oblonga, 2.1 mm longa, membranacea. Sepala 6, in duobus seriebus, duo exteriora lanceolata, margine serrata, apice acuta, 2.25 mm longa et 0.7 mm lata; cetera quatuor obovata, acuta, integra vel parum lobata 3 mm longa et 0.8-1 mm lata, membranacea, omnia uninervia. Petala 6-9, libera, dissimilia, exteriora breviter unguiculata, 3 mm longa et 1.9 mm lata interiora cum unguibus longis, 3.5 mm longa, 1.7 mm lata, ad marginem supra involuta, apice rotundata, gracilia, pinnatinervia. Stamina 10-11, libera; filamenta 4-5 mm longa, antheræ 4-lobatæ, extrorsæ, 0.35 mm longæ.

TYPE : *s. coll., s.n.*, Herb. US 2525132, Russia, 8 January (holo-, US).

Climber. Stem ribbed, solid, slightly pubescent, internodes 4-6.5 cm long. Leaf petiolate; petiole 3-13.5 cm long, slender, much longer than the lamina, uppermost part of the petiole slightly pubescent; lamina peltate, inserted 0.9-1 cm from the base of the lamina, triangular ovate or 5-lobed, margin entire or lobed, apex mucronate, base slightly cordate or truncate, hairs few over veins on the upper surface, lower surface distinctly pubescent, lower surface pale; 3.8-7.3 cm long and 5.1-7.1 cm broad, usually palmately 10-nerved (upper 5-6 nerves more prominent), chartaceous (Pl. 1, *1*). ♂ inflorescence axillary, solitary or binary on ordinary leafy branches, pedunculate, umbel, peduncle 2.5-3.9 cm long, ribbed, glabrous, 7-13 flowers in an inflorescence. Flowers pedicellate, pedicel 3-6.5 mm long, bracteate, bract linear-oblong, 2.1 mm long, membranous; flower 3.5-5 mm long (excluding pedicel) and 4.5-6 mm broad (Pl. 1, *2*). Sepals 6, in two rows, the two outer sepals lanceolate with serrate margin, apex acute, 2.25 mm long and 0.7 mm broad; other 4 sepals obovate, apex acute, margin entire or slightly lobed, 3 mm long and 0.8-1 mm broad, membranous, usually 1 unbranched mid-vein present in all sepals (Pl. 1, *2A*). Petals 6-9, free, disimilar, outer petals shortly clawed, 3 mm long and 1.9 mm broad, inner petals with long claws, 3.5 mm long and 1.7 mm broad, upper margin involute, apex rounded, thin, 1 mid-vein present which gives lateral branches on either side, lateral branches divide again (Pl. 1, *2B*). Stamens 10-11, free, 4-5 mm long; anthers 4-lobed, 0.35 mm long, extrose (Pl. 1, *2C*).



Pl. 1. — **Menispermum miersii** Kundu & Guha : **1,** part of the male plant with inflorescences; **2,** different parts of the male flower (A : sepals, B : petals, C : stamens).

ANATOMY

T. S. OF THE STEM: Transverse of the stem shows the following structures (Pl. 2, *3*). Epidermis single-layered with moderately thick cuticle on the outer walls of the epidermal cells. Cortex is thin and is composed of 6-7 layers of collenchyma cells. Scattered thick walled cells (sclereids) are found in the cortex.

Vascular cylinder is composed of 18 vascular bundles; each vascular bundle is provided with crescent shaped bundle cap. Bundle caps consist of 5-7 layers of sclerenchyma cells and join with one another forming a continuous ring. Xylem is endarch; vascular bundles are separated from one another by 3-5 layers of thick walled cells. Pith comparatively large and consists of large parenchyma cells with intercellular spaces; scattered thick walled sclereids also present.

T. S. OF THE PETIOLE: Transverse section of the basal part of the petiole (Pl. 2, *4A*) shows the following structures. Epidermis is single-layered and cutinised. Cortex is collenchymatous. Nine vascular bundles (3-4 vascular bundles smaller), are present; bundle caps absent. Petiole is not grooved. The middle part of the petiole is more or less circular in outline and the T. S. (Pl. 2, *4B*) shows similar structures as in basal part but has certain differences. Here the cortex is much narrower and the pith much larger than the basal part. Each bundle is provided with crescent shaped sclerenchymatous bundle cap which joins with one another forming a continuous ring. T. S. of the uppermost part of the petiole (Pl. 2, *4C*) shows structures similar to that of basal region except that here only 7 vascular bundles are present. All the bundles are more less equal in size.

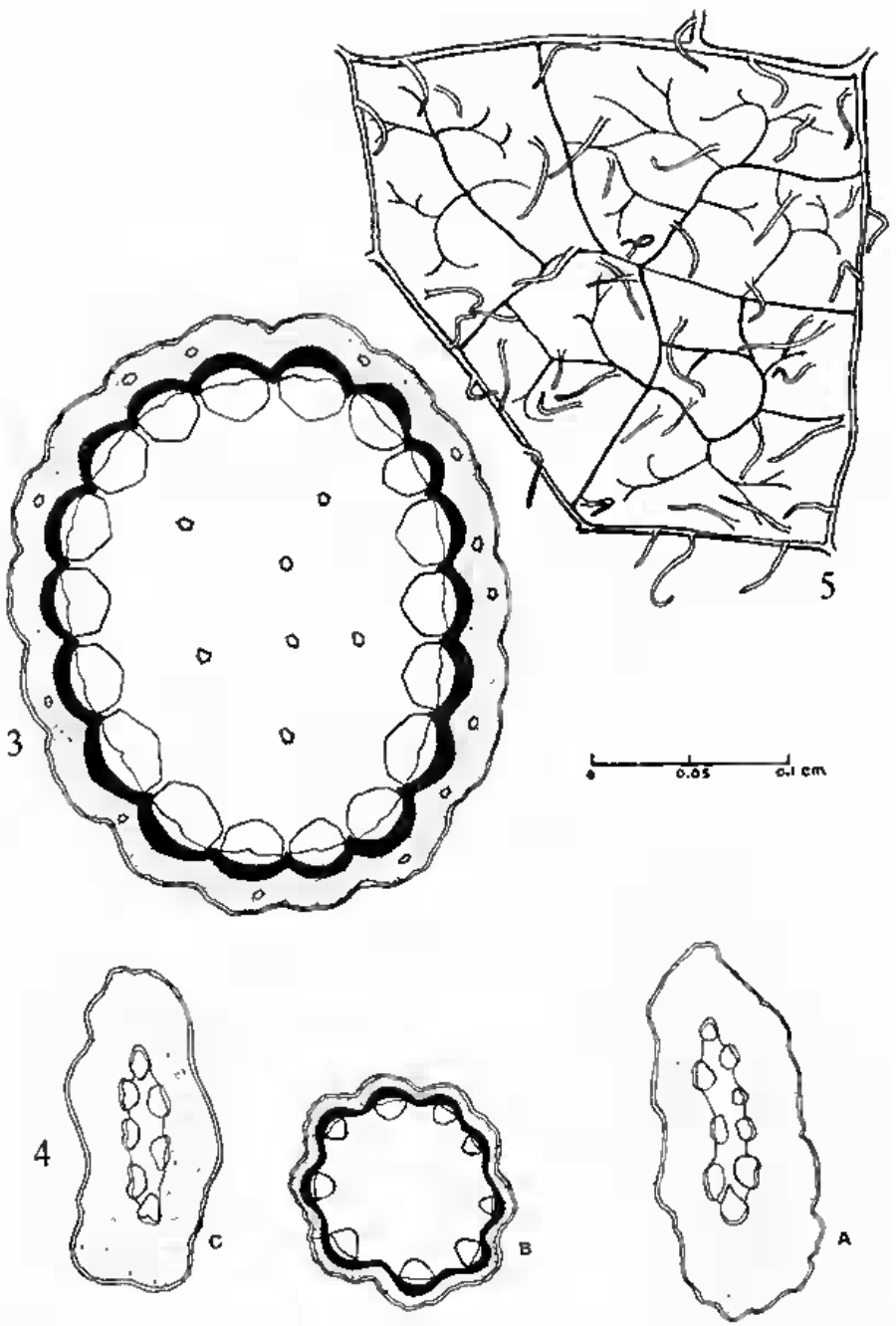
VEIN ISLETS AND VEIN ENDINGS (Pl. 2, *5*): The number of vein islets is 3.5 /sq. mm and the number of vein endings is 10.9 /sq. mm.

The ratio of the epidermal cell and palisade cell is 1:12. Anomocytic stomata present on the lower surface.

PALYNOLOGY

Pollen grains trizono-colpate, prolate (25 × 15 μm), reticulate, homobrochate; reticulation less conspicuous than *M. canadense*. Lumina less than 1 μm in diameter, bacula top swollen, thinner at base, tops united; colpus margin not strictly delimited, margo absent, the margin broken in a zigzag pattern; amb convex, rounded colpus in polar view deeply lobed; exine 2.5 μm thick, sexine thicker than nexine. — (Pl. 7, *11-12*).

The differences between *M. miersii* and *M. dahuricum* are shown in the following table.

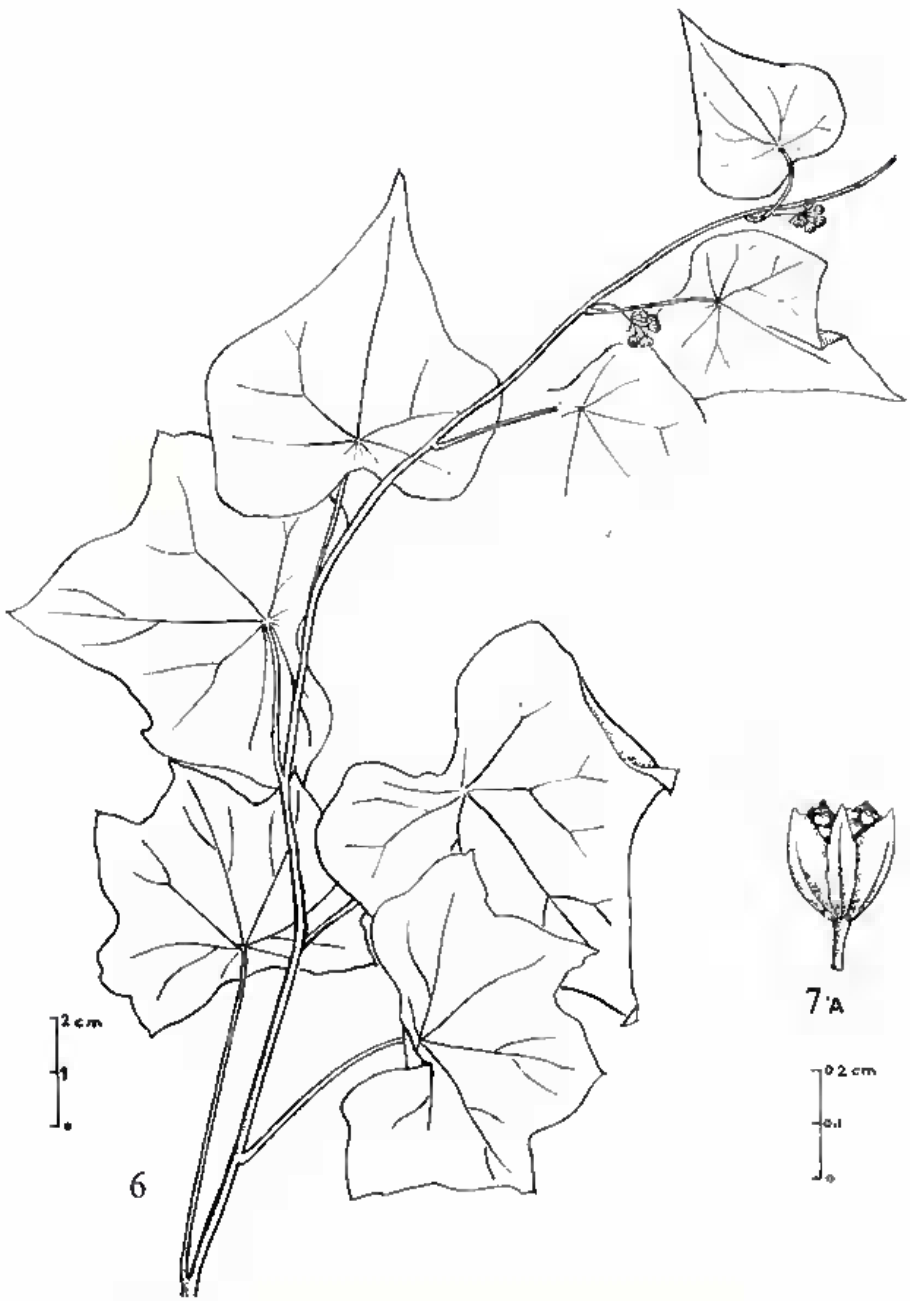


Pl. 2. — **Menispermum miersii** Kundu & Guha : **3,** T.S. of the stem; **4,** T.S. of the petiole at different regions (A : basal region, B : middle region, C : upper region); **5,** venation : many hairs are seen on the lower surface.

Character	*M. miersii*	*M. dahuricum*
Stem	Slightly pubescent.	Glabrous.
Petiole	Very long, upto 13.5 cm long. Much longer than the lamina. Hairs present on the uppermost part of the petiole.	Slightly longer or more or less equal to the lamina. Glabrous.
Lamina	Lower surface distinctly pubescent, few hairs over veins on the upper surface.	Glabrous.
Petals	Dissimilar, inner sepals with long claws.	Similar, with no distinct claw.
Filament	Very long, upto 5 mm long.	Not very long, upto 2.5 mm long.
Pollen-size	25 × 15 μm.	22.5 × 15 μm.

The differences between *M. miersii* and *M. canadense* are shown in the following table.

Character	*M. miersii*	*M. canadense*
Leaf	Distinctly peltate.	Slightly peltate.
Number of flowers in an inflorescence	7-13 flowers.	18-35 or more.
Petals	Dissimilar, inner petals with distinct claws.	Similar, petals slightly clawed.
Stamens	10-11.	Usually 18.
Filament	Very long, upto 5 mm.	Not long, upto 2 mm long.



Pl. 3. — **Menispermum chinensis** Kundu & Guha : **6,** a part of the male plant with inflorescences; **7 A,** male flower.

Menispermum chinensis Kundu & Guha, *sp. nov.*

Caulis scandens, solidus, costatus, glaber, cum radicibus adventitiis, internodia 3-5.5 cm longa. Folia petiolata, irregulariter 3-5 lobata, 4.2-6.2 cm longa et 5.5-6.9 cm lata, plerunique palmatim 8-nervia (5 nervi prominentes), interdum usque ad 11-nervia, chartacea, basi cordata, apice acuminata, interdum mucronulata, margine integra, infra pubescentia, supra parum pubescentia in nervis, petiolis gracilibus, 2.8-6.1 cm longis, apice parum pubescentibus, plerumque plus minusve laminas æquantibus, 0.4-0.7 cm a basi laminarum insertis; laminis peltatis.

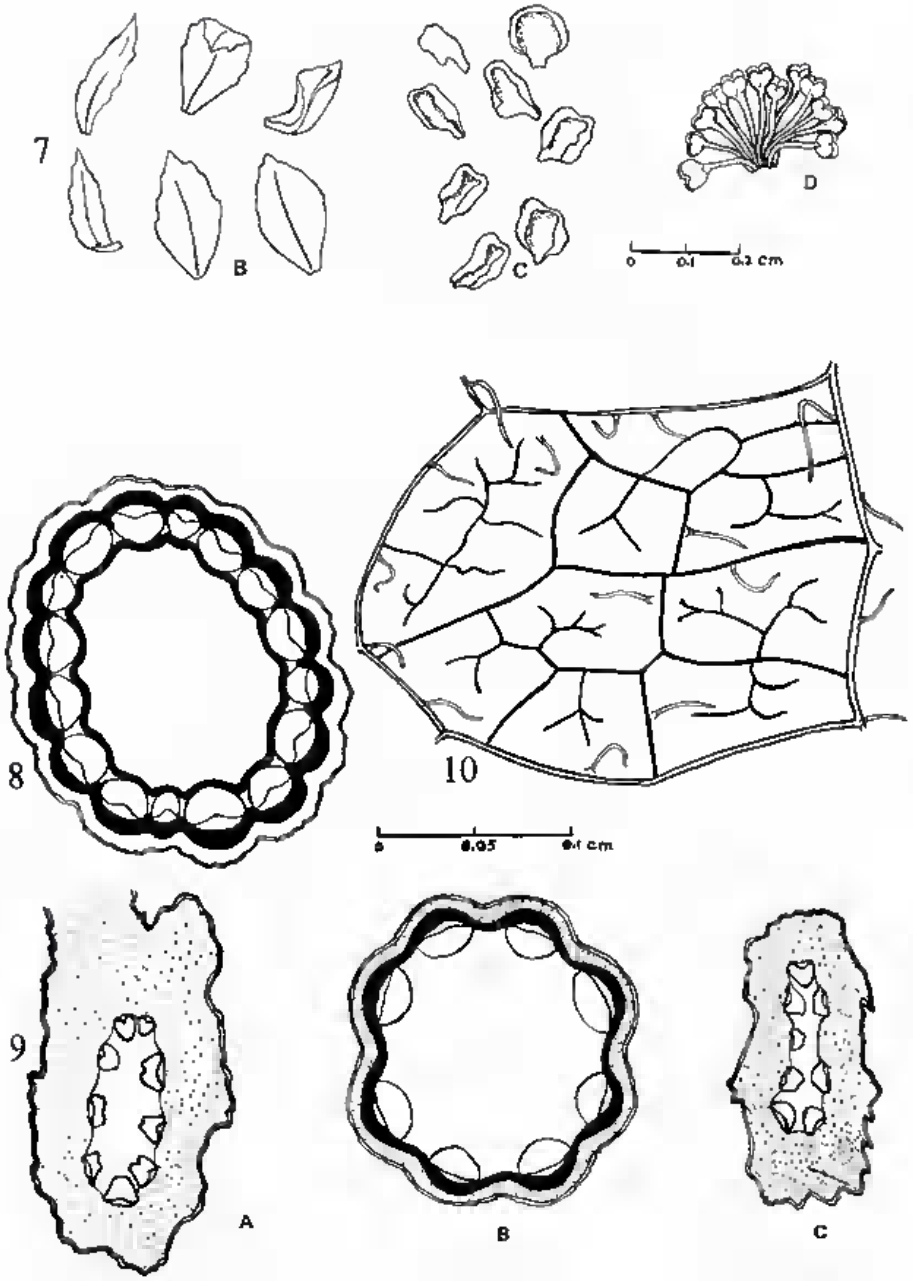
♂ inflorescentia axillaris, solitaris, pedunculata, umbellata, 4-6-flora, 1.1-1.7 cm longa, pedunculis 0.6-1 cm longis glabris, in ramis foliatis. ♂ flores pedicellati, 1.7-2.2 mm longi (pedicello excepto) et ca. 2.5 mm lati; pedicellus plerumque 0.5-1 mm longus, interdum usque ad 2 mm longus, bracteate, bracteæ lineari-oblongæ, 2.5 mm longæ, membranaceæ. Sepala 6, libera, duo exteriora lanceolata, margine serrata, apice acuta, basi truncata, 2.5 mm longa et 0.7 mm lata, quatuor interiora elliptico obovata, apice acuta, ad marginem serrata, 2.3 mm longa et 1.2 mm lata, omnia uninervia, membranacea. Petala 8-9, libera, basi unguiculata, margine involuta, subarbicularia, cum unguibus brevibus, 1.3 mm longa, 1 mm lata, carnosa. Stamina 12, libera; filamenta 1.2-1.5 mm longa; antheræ 4-lobatæ, 0.7 mm latæ.

TYPE : *Togaschi 1445*, N. China, 18.8.1945 (holo-, TYO).

Stem climbing, with adventitious roots, solid, ribbed, glabrous, internodes 3-5.5 cm long. Leaf (Pl. 3, *6*) petiolate; petiole slender, 2.8-6.1 cm long, few hairs at the tip, otherwise glabrous, usually more or less equal to the lamina; petiole inserted 0.4 to 0.7 cm from the base of the lamina; lamina peltate, irregularly 3-5-lobed, base cordate, apex acuminate sometimes mucronulate, margin entire, slightly pubescent over veins on the upper surface; lower surface pubescent, 4.2-6.2 cm long and 5.5-6.9 cm broad, palmately 8-nerved (5 nerves prominent) usually, sometimes upto 11-nerved, chartaceous. ♂ inflorescence axillary, solitary, pedunculate umbel on leafy branches, 4-6 flowers in each inflorescence, 1.1-1.7 cm long; peduncle 0.6-1 cm long, glabrous. ♂ flower (Pl. 3, *7A*) pedicellate, pedicel usually 0.5-1 mm long, sometimes upto 2 mm long; flowers 1.7-2.2 mm long (without pedicel) and about 2.5 mm broad, bracteate, bracts linear-oblong, 2.5 mm long, membranous. Sepals 6 (Pl. 4, *7B*) free, outer two lanceolate, margin serrate, apex acute, base truncate, 2.5 mm long and 0.7 mm broad, inner 4 sepals elliptic obovate, apex acute, upper margin serrated, 2.3 mm long and 1.2 mm broad, all sepals with 1 mid-vein, membranous. Petals 8-9 (Pl. 4, *7C*), free, unguiculate at base, margin involute, sub-orbicular with short claw, 1.3 mm long and 1 mm broad, fleshy. Stamens 12 (Pl. 4, *7D*), free; filament 1.2-1.5 mm long, anthers 4-lobed, 0.7 mm broad.

ANATOMY

T. S. OF THE STEM (Pl. 4, *8*): Epidermis single-layered with moderately thick cuticle on the outer walls. Cortex thin and composed of 6-7-layered collenchyma cells. Sixteen vascular bundles are present, with crescent shaped sclerenchymatous bundles caps which unite with one another forming a continuous ring; xylem well developed, endarch. On the inner side of the vascular bundles there is a sclerenchymatous ring consisting of four layers of cells. Pith consists of large thin walled cells with abundant intercellular spaces.



Pl. 4. — **Menispermum chinensis** Kundu & Guha : **7 B, 7 C, 7 D,** sepals, petals and stamens of the male flower; **8,** T.S. of the stem; **9,** T.S. of the petiole at different regions (A : basal part, B : middle part, C : upper part); **10,** venation : only a few hairs are present on the lower surface.

T. S. OF THE PETIOLE: Transverse section through the basal part of the petiole shows the following structures (Pl. 4, *9A*). Epidermis single-layered, cutinised, cortex collenchymatous, vascular bundles 9, two smaller bundles later fuse, bundle cap absent, pith comparatively small parenchymatous. Transverse section through the middle part of the petiole shows the following structures (Pl. 4, *9B*) : cortex narrower and the pith much larger than the basal part; vascular bundles 8, equal in size, sclerenchymatous bundle caps present and unite to form a continuous ring; middle part of the petiole is more or less circular in T.S. Transverse section through the uppermost part of the petiole shows the following structures (Pl. 4, *9C*): cortex thick collenchymatous, 8 vascular bundles without any sclerenchymatous caps present, pith narrow.

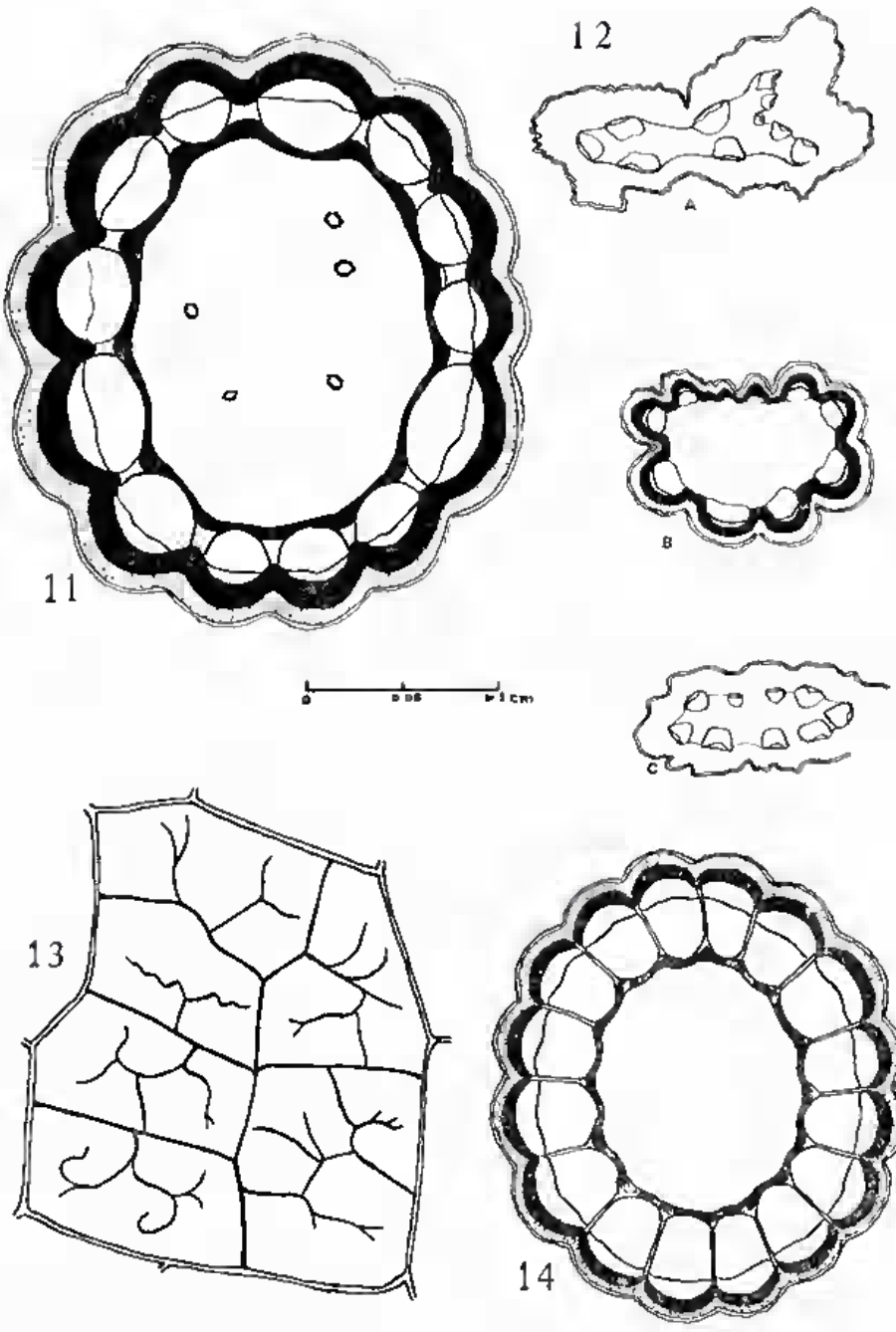
VEIN ISLETS AND VEIN ENDINGS (Pl. 4, *10*): The number of vein islets is 2.2/sq. mm and the number of vein ending is 6.87/sq. mm. These are similar to that of *M. dahuricum* where the number of vein islets and vein endings are 2.5/sq. mm and 7/sq. mm respectively.

PALYNOLOGY

Pollen grains trizono-colpate, prolate (24 × 15 μm), reticulate; lumina less than 1 μm in diameter, homobrochate, penta-hexagonal, smaller than *M. canadense*, bacula free at base, united at apex, colpi slit like, distinctly delimited with thin margin; in polar view amb convex and rounded; exine 3 μm thick, sexine thicker than nexine. — (Pl. 7, *8-10*).

M. chinensis differs from *M. dahuricum* and *M. canadense* in the following features.

CHARACTER	*M. chinensis*	*M. dahuricum*
Petiole	Hairs present at the tip of the petiole.	Glabrous.
Lamina	Pubescent, specially at the lower surface, few hairs present over veins at the upper surface.	Glabrous.
Inflorescence . . .	Upto 2 cm long; peduncle 0.6-1 cm long; 4-6-flowered.	Upto 4 cm long; peduncle 1.2-3.5 cm long; 7-14-flowered.
Pedicel	0.6-1 mm long.	Upto 3.5 mm long.
Sepal	Outer sepals lanceolate; inner sepals elliptic ovate.	Usually obovate.
Petal.	Very fleshy.	Not so fleshy.



Pl. 5. — **Menispermum dahuricum** DC. : **11,** T.S. of the stem : a few sclerotic cells are seen in the pith; **12,** T.S. of the petiole (A : basal part, B : middle part, C : upper part); **13,** venation : no hairs present. — **Menispermum canadense** L. : **14,** T.S. of the stem.

CHARACTER	*M. chinensis*	*M. canadense*
Inflorescence . . .	Upto 2 cm long; 4-6-flowered.	3-9.5 cm long; 17 or more-flowered.
Pedicel	0.6-t mm long.	2.5-5 mm long.
Petal.	Very fleshy.	Not so fleshy.

Menispermum dahuricum DC.

ANATOMY

T. S. OF THE STEM (Pl. 5, *11*) shows the following structures:

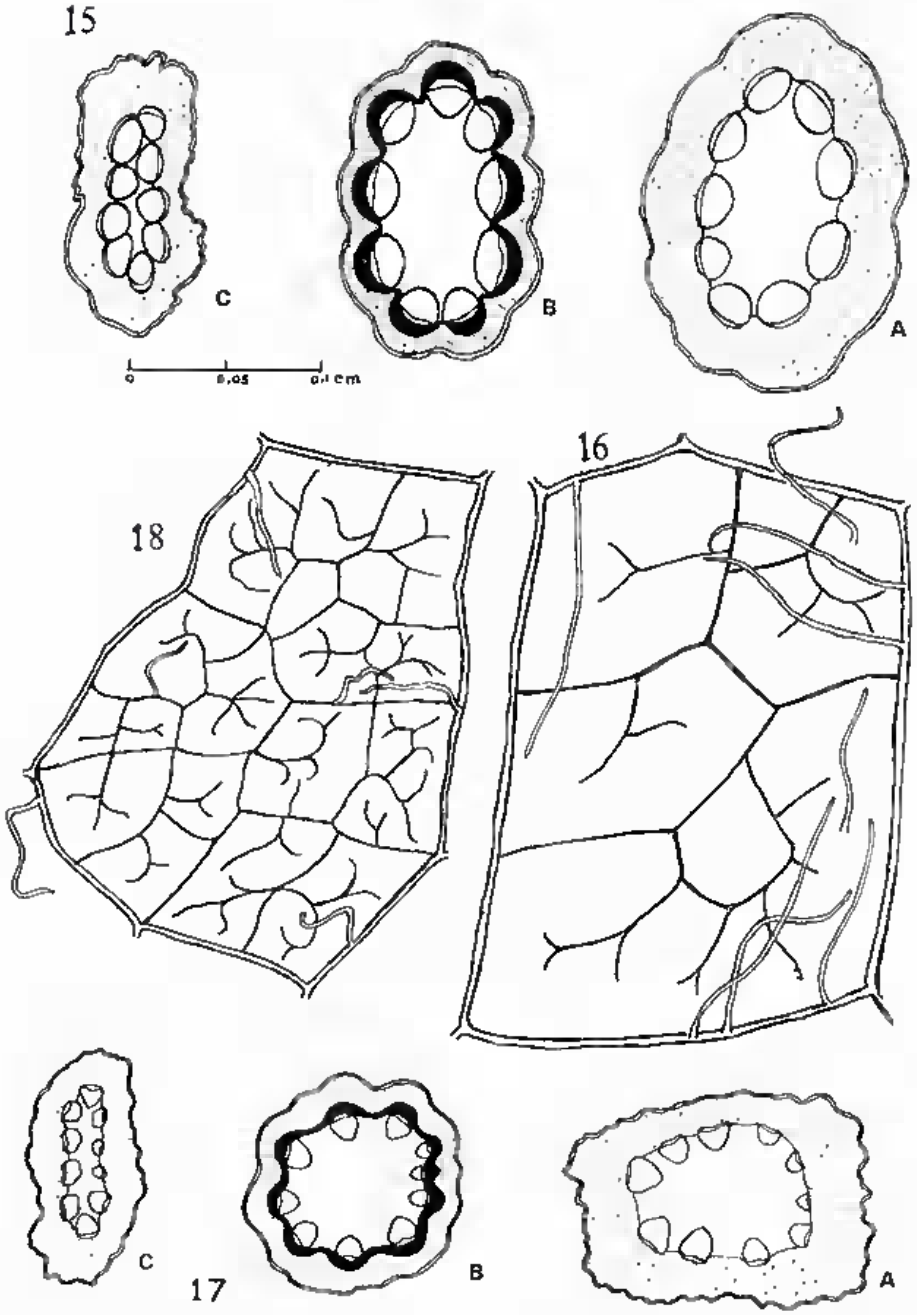
Epidermis single-lavered with thick cuticle; cortex narrow, collenchymatous; the number of vascular bundle varies from 13-15 or more. The bundle cap is continuous and is composed of 7-8 layers of sclerenchyma cells, vascular bundles are broad; on the inner side of the vascular cylinder 2-4 layers of sclerenchyma cells are present in the form of a ring. Scattered thick-walled cells are observed in the pith. In the female specimen no sclerotic cells are found in the pith.

T. S. OF THE PETIOLE: Transverse section of the basal part of the petiole of ♂ plant shows the following structures (Pl. 5, *12A*):

Epidermis is single-layered, cutinised; cortex collenchymatous, vascular bundles 10, 3-4 of them are smaller and arranged towards the slightly grooved side of the petiole; bundle caps absent, pith narrow, parenchymatous. In the ♀ plant 9 vascular bundles are recorded, 4 of them smaller, and the pith is comparatively thick.

T. S. through the middle part (Pl. 5, *12B*) of the petiole of ♂ plant shows similar structures; but it has certain differences. Here the cortex is much narrower and the pith much larger than the basal region. Sclerenchymatous bundle caps present which join with one another forming a continuous ring. Out of 10 vascular bundles, 4 are smaller and are placed towards the flattened side of the petiole. In ♀ plant the cortex is more broad and nine vascular bundles are present. T. S. through the uppermost part (Pl. 5, *12C*) of the petiole of ♂ plant shows thick collenchymatous cortex, 9 vascular bundles are present, 3 of them smaller, pith comparatively smaller than the middle part of the petiole. In ♀ plant 8 vascular bundles are present, 3 of them smaller and bundle caps present.

VEIN ISLETS AND VEIN ENDINGS (Pl. 5, *13*): The number of vein islets is 2.5/sq. mm and the number of vein endings is 7.5/sq. mm in ♂ plant. In the female plant the number of vein islets is more or less same but the number of vein endings is 9.5/sq. mm.



Pl. 6. — **Menispermum canadense** L. : **15**, T.S. of the petiole (A : basal part, B : middle part, C : upper part); **16**, venation : few very long hairs are seen. — **Menispermum dahuricum** DC. var. **mexicanum** (Rose) Kundu & Guha : **17**, T.S. of the petiole (A : basal part, B : middle part, C : upper part); **18**, venation : few hairs are present.

PALISADE RATIO: The ratio of epidermal cell and palisade cell is 1:8.5. In female plant of *M. dahuricum* the ratio is 1:12.

Stomata are anomocytic.

PALYNOLOGY

Pollen grains trizono-colpate, prolate (22.5 × 15 μm), reticulate, lumina less than 1 μm in diameter, homobrochate, bacula free at base, united at the apex; colpi slit like, distinctly delimited with thin margin; amb convex and rounded; exine 3 μm thick, sexine thicker than nexine. — (Pl. 7, *4-7*).

Menispermum canadense L.

ANATOMY

T. S. OF THE STEM (Pl. 5, *14*) shows the following structures: Epidermis single-layered with moderate cuticle, cortex 5-6-layered, collenchymatous, bundle caps sclerenchymatous, 3-6-layered, not united with one another; vascular bundles 16-19, 3-4 layers of sclerenchymatous cells form a continuous ring towards the inner side of the vascular bundles.

T. S. OF THE PETIOLE: Transverse section through the basal part (Pl. 6, *15A*) of the petiole of ♂ plant shows the following structures: Epidermis single-layered, cutinised, cortex collenchymatous, vascular bundles 9, more or less equal in size, bundle caps absent, pith comparatively large. T. S. through the middle part (Pl. 6, *15B*) of the petiole shows similar structure but here the cortex is narrower, bundle caps present, which unite with one another forming a continuous ring.

T. S. of the uppermost part (Pl. 6, *15C*) of the petiole of both ♂ and ♀ plants shows structures similar to that of basal region but here the pith. is very narrow and the vascular bundles are closely placed.

VEIN ISLETS AND VEIN ENDINGS (Pl. 6, *16*): The number of vein islets is 1.5 in ♂ and 2 in ♀/sq. mm. The number of vein endings is 5/sq. mm.

PALISADE RATIO: The ratio of epidermal cell and palisade cell is 1:9.7 in ♂ plant. In female plant the palisade ratio is 1:12.

Stomata are anomocytic.

PALYNOLOGY

Pollen grains trizono-colpate, isopolar, prolate (29 × 15 μm), in polar view amb convex colpi elongated, tapering, colpi membrane smooth, with thin margin, end pointed, free; exine 3 μm thick, sexine (2 μm) thicker

than nexine (1 μm), exine tectate, reticulate, lumina more than 1 μm in diameter, heterobrochate, penta-hexagonal, bacula free at base, united at apex to form the muri. — (Pl. 7, *1-3*).

Menispermum dahuricum DC. var. **mexicanum** (Rose) Kundu & Guha, *stat. nov.*

— *Menispermum mexicanum* Rose, Contr. U.S. Nation. Herb. 13 (9) : 302 (1911).

Type : *Pringle 10378*, Mexico, 9.7.1907 (holo-, US).

T. S. of the stem: It is similar to that of *M. dahuricum*. Here 16 vascular bundles are present.

T. S. of the petiole (Pl. 6, *17*) shows structures similar to the female plant of *M. dahuricum* but the number of vascular bundles is 10, three of them smaller.

Vein islets and vein endings (Pl. 6, *18*): The number of vein islet is 3.7/sq. mm and the number of vein endings is 11.6/sq. mm.

The ratio of epidermal cell and palisade cell is 1:8.
Stomata are anomocytic.

Rose (1911) established the species *M. mexicanum* on the basis of structure of fruit and geographical distribution. This material having only fruits was collected from Mexico.

M. mexicanum is very similar to that of *M. dahuricum* morphologically but it has some minor anatomical differences with *M. dahuricum* such as:

1. Slightly greater number of vein islets and vein endings per sq. mm.
2. Palisade ratio (1:7.63) also differs from that of ♀ *M. dahuricum*.
3. Presence of few hairs on the lamina. In *M. dahuricum* the leaves are usually glabrous.

But these differences are minor. So this specimen (♀) should be included within *M. dahuricum* and treated as a variety.

COMPARATIVE ANALYSIS OF THE POLLEN GRAINS OF FOUR DIFFERENT SPECIES OF *MENISPERMUM*.

In general pattern of morphology the grains of all the four species, namely, *M. canadense*, *M. dahuricum*, *M. chinensis* and *M. miersii*, are more or less the same with slight interspecific variations. With regard to size three groups can be delimited, namely 1. *miersii—chinensis* (polar axis 24-25 μm), 2. *dahuricum* (p.a. 22 μm) and 3. *canadense* (p.a. 29 μm); in all cases equatorial diameter being the same, i.e. 15 μm. So far as exine surface pattern

is concerned two distinct groups can be delimited, namely 1. *miersii — chinensis — dahuricum* group (finely reticulate, homobrochate, lumina 1 μm) and 2. *canadense* group (coarsely reticulate, heterobrochate, lumina 1 μm).

On the other hand *miersii* forms a distinct pollen group unlike the other three species by having undelimited colpus margin, broken in zigzag pattern

TABLE COLLOCATION OE POLLEN MORPHOLOGICAL DATA OF FOUR SPECIES OE MENISPERMUM

	M. canadense	*M. dahuricum*	*M. chinensis*	*M. miersii*
APERTURAL CONDITION	3-zono-colporate	3-zono-colporate	3-zono-colporate	3-zono-colporate
SHAPE — EQUATORIAL VIEW	Prolate	Prolate	Prolate	Prolate
SHAPE — POLAR VIEW	Colpus deeply lobed.	Colpus deeply lobed.	Colpus deeply lobed.	Colpus deeply lobed.
SIZE	29 × 15 μm	22 × 15 μm	24 × 15 μm	25 × 15 μm
EXINE THICKNESS	3 μm	3 μm	3 μm	2,5 μm
SURFACE PATTERN	Reticulation heterobrochate.	Reticulate fine, homobrochate (more conspicuous than *M. chinensis*).	Reticulate fine, homobrochate.	Reticulate fine, homobrochate.
APERTURAL CHARACTER	Colpus margin delimited, colpus membrane smooth.	Colpus margin delimited.	Colpus margin delimited.	Colpus margin undelimited.
	Thin margin.	Thin margin.	Thin margin.	Margo absent.
AMB CHARACTER	Margin not broken in zigzag pattern.	Same.	Same.	Margin broken in zigzag pattern.
	amb convex.	amb convex.	amb convex.	amb convex.

Pl. 7. — Pollen grains of the four species of **Menispermum** : **1-3, M. canadense** L.; **4-7, M. dahuricum** DC.; **8-10, M. chinensis** Kundu & Guha; **11-12, M. miersii** Kundu & Guha.

where margo is absent, whereas in the other three species colpus margin is delimited provided with thin margo.

It may be concluded that although gross pollen morphologically the four species are more or less the same, but a critical study reveals that there are variations in certain micromorphological features sufficient to warrant specific delimitations.

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